ROLE OF BIG DATA ANALYTICS IN INDIAN FARMING

K Naga Latha[1*], V Mathuabirami[2] and Tadepalli Yamini[3]

[1]*Assistant Professor, Agricultural Statistics, [2]Assistant Professor, Agricultural Extension Education,*
Kaveri University, Gowraram, Siddipet, Telangana-502279
[3]*Assistant Professor, KBR College of Agriculture, C. S. Puram, Kanigiri, Andhra Pradesh-523112*
*Corresponding Author Mail ID: nagalatha.k@kaveriuniversity.edu.in

Introduction

Agriculture has always been the backbone of India's economy, providing livelihoods to nearly half of the country's population. Traditional farming methods, however, have a number of difficulties, such as erratic weather patterns, degraded soil, a lack of water, and shifting market pricing. "Big Data Analytics" has changed the agricultural landscape in India in recent years by assisting farmers in making data-driven choices that increase output and profitability.

What is Big Data Analytics in Agriculture?

Big Data Analytics is the process of gathering, processing, and evaluating enormous volumes of agricultural data in order to extract valuable insights. These data sources include market trends, crop production data, soil health surveys, satellite images, weather forecasts, and even farmer interactions on social media. Big Data Analytics uses cutting-edge technology like artificial intelligence (AI), machine learning (ML), and the internet of things (IoT) to help make Indian agriculture a more accurate, effective, and sustainable industry.

Role of Big Data in Transforming Indian Farming

1. **Precision Farming:**

Big data analytics is playing a vital role in modern agriculture by enabling farmers to use huge amount of information to make smarter, more precise decision-making. By analysing data collected from sensors, satellites, drones, and farm equipment, big data tools uncover patterns and insights related to soil fertility, crop growth, weather changes, and resource usage. This empowers farmers to optimize planting schedules, irrigation, fertilization, and pest control strategies with greater accuracy. As a result, big data analytics contributes to increased crop yields, reduced input costs, and improved sustainability, making agriculture more efficient, resilient, and environmentally friendly.

2. **Prediction of Climatic Changes:**

Earth is enduring concurrent changes like increasing population, pollution, depleting ozone layer, emission of greenhouse gases is increasing by the advancement in the technology or infrastructure in cities, et., this cumulative effect leads to climate change. With climate change posing a significant threat, reliable weather forecasts are essential for planning agricultural activities. Climate data have generally different sources such as in situ, remote sensing data, model output and paleoclimatic. Big Data Analytics integrates the data from different sources and estimate historical weather patterns with predictive models to provide accurate forecasts, helping farmers mitigate risks.

3. **Price Forecasting of Agricultural Commodities:**

Short-term forecasting of prices of agricultural commodities plays a significant role in Indian farming. Fluctuating crop prices remain a major concern for Indian farmers. Prices of some commodities like tomatoes, onions, garlic etc., vary very

frequently and it is very difficult to predict also. So, in such situation big data analytics uses historical data from different market areas to analyse market trends, government policies this will help farmers determine the best time to sell their produce for maximum returns. When farmers receive the price estimates timely and accurately so they can plan accordingly.

4. **Efficient Irrigation Management:**

Given India's water scarcity issues, effective irrigation management practices are crucial. Data-driven irrigation systems assess soil and weather conditions to optimize water use, ensuring adequate hydration while conserving resources. To ensure better irrigation without wastage of water so many digital solutions available like IOT and Big data based smart irrigation systems. This system works based on the water requirement of the particular crop in different growth periods. Many wealthy countries have adopted modern irrigation management techniques, leveraging big data and the internet of things to detect leaks, measure water, plan, monitor, and distribute water.

5. **Postharvest Management:**

Post harvest of grain processes plays a crucial role in agricultural value chain, involving the activities like transportation of commodities, storage and preservation which significantly improves the quality, quantity and cost of product. Big Data aids in optimizing the agricultural supply chain by predicting demand and reducing post-harvest losses. Predictive analysis using big data allows stakeholders to anticipate risks and take proactive measure to overcome those risk. By improving decision-making in storage, transportation, and distribution, it ensures smoother market operations. It will intern enhance sustainability, profitability and food security across the agricultural value chain.

6. **Prediction of Pest and Diseases:**

In agriculture outcome of the crop is majorly influenced by the pest and diseases. There is a need of automatic detection, identification and prediction of pest and diseases to overcome this challenge. To perform such automation and prediction big data analytics can be used. Big data analytics works by integrating the environmental and past historical data of pest and diseases. AI-based analytics tools assess past pest outbreaks and disease occurrences to predict potential threats. Farmers receive real-time alerts, allowing them to take preventive measures and minimize crop damage.

Challenges and the Way Forward

Despite its potential, there are difficulties to the widespread use of Big Data Analytics in Indian agriculture, including low levels of digital literacy among farmers, poor internet access in rural areas, and high costs of technology. The future appears bright, though, given the growing number of government programs like "Digital India," "PM-KISAN," and "Agri-Tech Startups". Innovation in this field can be further stimulated by partnerships among agricultural research institutes, tech companies, and policy makers.

Conclusion

Big Data Analytics is transforming Indian agriculture by making it possible for farmers to access markets more effectively, manage resources more efficiently, and practice precision farming. Adopting data-driven decision-making would be essential to attaining profitable and sustainable farming in India as technology develops further. Big Data can empower Indian farmers, increase production, and guarantee food security for the expanding population if the proper infrastructure and policies are in place.

References

1. Faghmous JH, Kumar V. A Big Data Guide to Understanding Climate Change: The

Case for Theory-Guided Data Science. Big Data. 2014 Sep 1;2(3):155-163.

2. Rather, Nasir & Huda, Mir. (2023). Irrigation Water Measurement. 10.1201/9780429290114-14.

3. Satellite Solutions for Agriculture: Boost Yields & Manage Risks. https://farmonaut.com/remote-sensing/satellite-solutions-for-agriculture-from-cyclone-tracking-to-farm management-with-rapid-eye-and-identification-apps

4. Domingues, T., Brandão, T., & Ferreira, J. C. (2022). Machine Learning for Detection and Prediction of Crop Diseases and Pests: A Comprehensive Survey. *Agriculture*, *12*(9), 1350. https://doi.org/10.3390/agriculture12091350